

Discussions w/ G. Gallagher
[2-0792]



7/1/81

NRR (Hood, Rimaldi & Kane) had discussions w/ CPCs about surcharging the RWST.

NRR had indicated the need to review the monitoring plans (settlement & cracking) which have been submitted to E&E (June 26, 1981 letter from Cook to Keppler)

NRR had questioned CPCs about cutting pipes that enter valve pits.

NRR feels criteria needs to be established on tolerable settlement (total & differential) & allowable cracking limits.

Until the Jan 26, 1981 report is reviewed & concerns resolved, NRR is not in the position for concurring w/ CPCs proceeding w/ surcharging the valve pits.

Our problem for reviewing this along w/ other review aspects & hearing demands.

Keppler

Immediate Action Letter - Concurring that CPCs will not proceed without concurrence from NRR

Record of Telephone Conversation 7/15/81
 Midland Project - Surcharging valve pits near Bechtel Water Tanks

On call

<u>CPCo</u>	<u>Bechtel</u>	<u>COE</u>	<u>NRC</u>
D. Budzak	No. Smenberg	H. Singh	D. Boyd
T. Thiruvengadam	S. Lo	W. H. Ho	R. Hernun
R. Ramonujan	J. Gibbons		F. Rinaldi
			J. Kune

Topics discussed:

- ✓ Tank is filled w/ water - Started in Oct. 1980
- ✓ How points for measuring strain on ring foundation were located
 Are high stress points from analysis - Max. B.M. w/ water load only
 not surcharge load
- * Will visually exam pit (internally from access shaft)
 daily for cracking
- * Analysis of surcharge load determined the amount of settlement
 to be 0.5"
- * (circled) Valve pit cracking - need criteria if cracks develop - what
 will be done. To be furnished by CPCo
- * Will provide ^{surveyed} elevation @ center of tank @ bottom & elevation
 to ring beam & at the connection
- ✓ * Show elevation & locations of 4" ϕ drain pipes

will use concrete blocks - Unit 2
Sand fill - Unit 1

2 of 3

Arrived @ 22' height of surcharge by causing 1/2" settlement
(evening of settlement)

0.5"/hr Integrate adding 25% load increment in two weeks, or until
settlement has stabilized
Hold while load on for six weeks

- * Acceptance criteria u exceed (0.5") @ any time
temporarily stop & evaluate & notify NRC (Required)
prior to any other loading

Brief discussion w/ Muser, Rutledge

~~Typical installation details of Barris Arches~~

- * Will indicate ref. B.M. to be used in measuring settlement
of valve pit &
- * Info for F. Rinaldi on service water valve pits



**Consumers
Power
Company**

J. Kane
Rec'd. 6/30/81
1184

James W Cook
Vice President - Projects, Engineering
and Construction

COPY

General Offices: 212 West Michigan Avenue, Jackson, MI 49201 • (517) 788-0550

June 26, 1981

Mr J G Keppler, Regional Director
Office of Inspection and Enforcement
US Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

MIDLAND PROJECT

DOCKET NOS 50-329 & 50-330

BOARATED WATER STORAGE TANK (BWST) - SURCHARGE PROGRAM

FILE: 0485.16, 0.4.9.49 UFI: 73*10*01, 71*01

UFI: 01100(E), 02362 (S), 00234(S) SERIAL: 12799

REFERENCES: J W COOK LETTERS TO J G KEPPLER: SAME SUBJECT

- (1) SERIAL 11201; DATED FEBRUARY 20, 1981
- (2) SERIAL 11528; DATED APRIL 3, 1981
- (3) SERIAL 12015; DATED JUNE 12, 1981

ENCLOSURES: (1) SURCHARGING AND MONITORING "FIELD OPERATIONS SUMMARY"
(2) BECHTEL DRAWING NO C-1148 (Q) - Rev 2
(3) BECHTEL DRAWING NO C-1152 (Q) - Rev 1
(4) DESIGN CHANGE NOTICE NO. 1 FOR DRAWING NO C-1152 (Q)

This letter, as were the referenced letters, is an interim 50.55(e) report concerning the existence of cracks in the borated water storage tank foundation.

In accordance with commitments made with the NRR staff in meetings on May 5, 6, 7, 1981, we are forwarding the four enclosed documents which identify the design and procedural controls established for the monitoring program related to the borated water storage tank valve pit surcharge. It should be noted that specific direction is provided in these documents relative to the following: (1) settlement monitoring program; (2) strain gage installation and operation (provides input relative to structural distress); (3) visual crack mapping (provides input relative to structural distress); and (4) cutting of piping prior to application of surcharge.

We call your attention to the four 18-inch process lines identified on Enclosures 2 and 3. These four lines along with the four smaller diameter fill and drain lines were cut within 2-feet and 4-feet, respectively, from the outside face of the BWST valve pit walls. The small portions of piping extending beyond the outer valve pit walls will settle together with valve pit

oc0681-0326a100

8107080160 3pt.

and the adjacent soil-mass under the action of the surcharge with an insignificant change in stresses.

The settlement markers BW 1A, BW 2, BW 8A, and BW 9 shown on Enclosure 2 have been established to monitor the other buried portions of the 18-inch process lines. Settlement readings will be taken from these points prior to and after the surcharge. Pipe stress calculations were done on the process lines based on a predicted settlement of 0.48 inch and all stresses were within the elastic limit of the piping material. If the final settlement readings for these points exceed the expected settlement of 0.48 inch, additional piping stress calculations will be performed.

In our three-day meeting with the NRR Staff and Region III on May 5-7, 1981 we presented the details of our schedule for the BWST surcharge and remedial actions. As we indicated in the May meeting maintaining the schedule for the BWST Surcharge and remedial actions is very critical to our preoperations testing program.

We believe that the enclosed information combined with our discussions with the NRR Staff on May 5-7 and June 24, 1981 responds to NRR concerns. Further, as stated in our May 5-7, 1981 meeting we do not feel that this BWST problem is soils related. For these reasons and due to the importance of maintaining our schedule, we will begin surcharging the valve pits on July 6, 1981. If you have any additional concerns please inform us as soon as possible so that we can incorporate them into our surcharge program. This surcharge program does not foreclose any possible remedial fixes.

Another report, either interim or final, will be sent on or before September 15, 1981.

G.S. Keeby for JWC
 JWC/RAM/RLT/cr

CC Director, Office of Inspection & Enforcement
 Att Mr Victor Stello, USNRC (15)

Director, Office of Management
 Information & Program Control, USNRC (1)

RJCook, USNRC Resident Inspector
 Midland Nuclear Plant (1)

HRDenton, NRR (4) w/a
 JDKane, NRR (1)
 PLeech, NRR (1)
 CBechhoefer, ASLB Panel w/o
 RSDecker, ASLB Panel w/o
 FPCowan, ASLB Panel w/o
 MMCherry, Esq w/o
 MSinclair w/o

USNRC, Docketing and Service Section w/a
FJKelly, Esq, Attorney General w/o
SHFreelman, Esq, Asst Attorney General w/o
GTTaylor, Esq, Asst Attorney General w/o
WHMarshall w/o
GJMerritt, TNK&J w/o

4/84

Monitoring of structure is the indicator of satisfactory foundation behavior. Unacceptable structural behavior (excessive cracking) is indicating unanticipated foundation behavior which is a basis for stopping the surcharge operation since this work was intended to improve, not reduce, foundation conditions & structural behavior

JUL 29 1981

Docket Nos: 50-329
and 50-330

APPLICANT: Consumers Power Company

FACILITY: Midland Units 1 and 2

SUBJECT: TELEPHONE CONFERENCE ON JULY 15, 1981 ON BWST
SURCHARGE PROGRAM

PARTICIPANTS: <u>NRC</u>	<u>Consumers Power Company</u>
R. Hernan - DOL	D. Budzik
J. Kane - HGEB	
J. Rinaldi - SEB	
D. Boyd - I&E, Region III	
<u>Bechtel</u>	<u>U.S. Army Corps of Engineers</u>
N. Swanberg	H. Singh
S. Low	W. Otto
G. Griven	

DATE & TIME: JULY 15, 1981
2:25 - 3:45 p.m.

The purpose of the telephone conference was to discuss outstanding NRC questions on the surcharging procedure submitted by Consumers Power Company to rectify the differential settlement between the BWST's and adjoining valve pits. A plan had been submitted to the NRC on June 26, 1981 and had been reviewed by Nuclear Reactor Regulation (NRR) with the assistance of the U.S. Army Corps of Engineers. During the course of the telephone conference the following questions and requests for additional information were transmitted to the Consumers Power Company :

1. The proposed procedure provided for monitoring and mapping of the existing crack(s). NRR requested the cracking inspection be conducted on a daily basis. This plan must include what action will be taken upon discovery of new cracks or the widening of existing cracks.
2. Consumers Power was requested to provide elevations, which had been surveyed at the center of the BWST and at the edge (elevation of point at which the tank rests upon the ring beam) in order that the membrane stresses can be evaluated.

~~810813007~~ 400

JUL 29 1981

3. A print showing the relative elevations and orientations of the 3" and 4" lines (BWST fill and drain lines) with respect to the valve pit was requested by NRR. Consumers Power agreed to supply these prints.
4. NRR raised the question of what the maximum expected displacement of the valve pit would be under surcharging and what procedural controls existed to suspend the loading in the event that the maximum displacement was exceeded. Consumers Power agreed to add provisions to the procedure to stop loading the valve pit and perform an engineering evaluation if the expected settlement of 1/2" was exceeded. NRR also recommended using a plot of settlement vs. time during the surcharge period to determine if the settlement had stabilized under the planned incremental loading.
5. NRR questioned the location of the benchmark to be used for measuring settlement. Consumers Power agreed to describe to NRR what would be used as a reference benchmark.

Upon receipt of the above items, NRR agreed to assign a high priority to completing its review of the BWST surcharge plant, but this review is impacted by the demand for testimony preparation for the current ASLB hearing sessions.

RS
 R. W. Hernan, Project Manager
 Licensing Branch No. 4
 Division of Licensing

- cc: J. Kane
 F. Rinaldi
 A. Cappucci
 E. Gallagher
 G. Lear
 P. Leech
 R. Hernan
 J. Knight
 W. Paton
 E. Brown
 D. Hood *sent 7/22/81*
 E. Adensam

OFFICE	HGEB	LA:DL:LB#4	DL:LB:#4	<i>Rust</i>			
SURNAME	<i>J. Kane</i> JKane/hmg	<i>MDuncan</i> MDuncan	<i>EAdensam</i> EAdensam				
DATE	7/22/81	7/23/81	7/17/81				

MIDLAND

Mr. J. W. Cook
Vice President
Consumers Power Company
1945 West Parnall Road
Jackson, Michigan 49201

cc: Michael I. Miller, Esq.
Ronald G. Zamarin, Esq.
Alan S. Farnell, Esq.
Isham, Lincoln & Beale
Suite 4200
1 First National Plaza
Chicago, Illinois 60603

James E. Brunner, Esq.
Consumers Power Company
212 West Michigan Avenue
Jackson, Michigan 49201

Myron M. Cherry, Esq.
1 IBM Plaza
Chicago, Illinois 60611

Ms. Mary Sinclair
5711 Summerset Drive
Midland, Michigan 48640

Stewart H. Freeman
Assistant Attorney General
State of Michigan Environmental
Protection Division
720 Law Building
Lansing, Michigan 48913

Mr. Wendell Marshall
Route 10
Midland, Michigan 48640

Mr. Steve Gadler
2120 Carter Avenue
St. Paul, Minnesota 55108

Mr. Don van Farrowe, Chief
Division of Radiological Health
Department of Public Health
P.O. Box 33035
Lansing, Michigan 48909

William J. Scanlon, Esq.
2034 Pauline Boulevard
Ann Arbor, Michigan 48103

U.S. Nuclear Regulatory Commission
Resident Inspectors Office
Route 7
Midland, Michigan 48640

Ms. Barbara Stamiris
5795 N. River
Freeland, Michigan 48623

Mr. J. W. Cook

- 2 -

cc: Commander, Naval Surface Weapons Center
ATTN: P. C. Huang
White Oak
Silver Spring, Maryland 20910

Mr. L. J. Auge, Manager
Facility Design Engineering
Energy Technology Engineering Center
P.O. Box 1449
Canoga Park, California 91304

Mr. William Lawhead
U.S. Corps of Engineers
NCEED - T
7th Floor
477 Michigan Avenue
Detroit, Michigan 48226

Charles Bechhoefer, Esq.
Atomic Safety & Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Mr. Ralph S. Decker
Atomic Safety & Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dr. Frederick P. Cowan
Apt. B-125
6125 N. Verde Trail
Boca Raton, Florida 33433

J. Kane 3/84
Rec'd 3/24/81



James W Cook
Vice President - Projects, Engineering
and Construction

General Offices: 212 West Michigan Avenue, Jackson, Michigan 49201 • (517) 768-0550 81-03 #1

February 20, 1981

Mr J G Keppler, Regional Director
Office of Inspection & Enforcement
US Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

RECEIVED
1981 F
1 14

MIDLAND PROJECT -
DOCKET NOS 50-329, 50-330
CRACKS IN BORATED WATER STORAGE TANK FOUNDATION
FILE: O.4.9.49 UFI: 73*10*01, 02362(S), 01100(E) SERIAL: 11201

This letter confirms the 50.55(e) item concerning the existence of cracks in the borated water storage tank foundation. This condition was reported by telephone conversation to R Sutphin and G Gallagher, USNRC Region III, on January 22, 1981.

Enclosure 1 provides a description of the condition and the planned corrective action.

Another report, either interim or final, will be sent on or before April 3, 1981.

WJB/lr

Enclosure 1: Management Corrective Action Report MCAR-1, Report No 48, dated January 29, 1981 and Associated MCAR-48, Interim Report 1, dated February 17, 1981, "The Existence of Cracks in the Borated Water Storage Tank Foundation - Units 1 and 2"

cc: ~~Director, Office of Inspection & Enforcement
Attn: Mr. Walter Stalls, USNRC (18)~~

Director, Office of Management
Information & Program Control, USNRC (1)

RJ Cook, USNRC Resident Inspector
Midland Nuclear Plant (1)

3019
S
///

8102270771

2
Serial 11201

81-03 #1

CC: CBechhoefer, ASLB Panel
GALinenberger, ASLB Panel
FPCowan, ASLB Panel
AS&L Appeal Panel
MMCherry, Esq
MSinclair
CRStephens, USNRC
WDPaton, Esq, USNRC
FJKelly, Esq, Attorney General
SEFreeman, Esq, Asst Attorney General
GTTaylor, Esq, Asst Attorney General
WEMarshall
GJMerritt, Esq, TNK&J
Great Lakes QA Managers

021283 QUALITY ASSURANCE PROGRAM
MANAGEMENT CORRECTIVE ACTION REPORT
MCAR-1

JOB NO.: 7220 Q NO.: _____ REPORT NO.: 48
DATE: January 29, 1981

I DESCRIPTION* (Including References):

Excavations on the Borated Water Tank Foundation for Unit 1 disclosed cracks in the areas identified by the recent analysis as possibly being overstressed.

This condition has been reported to the NRC by the Consumers Power Company as a potential 10 CFR 50.55(e) item.

RECOMMENDED ACTION* (Optional):

1. Determine the impact of the condition of the ring foundation on the tank's integrity and ability to perform under all required conditions.
2. Determine what further actions will be required to maintain the design criteria for the Borated Water Tank to perform its intended function.
3. Coordinate and issue the first interim status report by February 9, 1981.

REFERRED TO: Engineering Construction QA Management _____
 Procurement

ISSUED BY: Arthur E. Bick 1/29/81
Project QA Engineer Date
c.f. 1: M.A. Dietrich

II REPORTABLE DEFICIENCY:

POTENTIAL

NOTIFIED CLIENT: January 22, 1981

NO

YES

John P. [Signature]
Project Manager Date

III CAUSE:

CORRECTIVE ACTION TAKEN:

AUTHORIZED BY: _____
Date

AAPD DISTRIBUTION	PROJ DISTRIBUTION	OTHER DISTRIBUTION
MGR OF CONSTRUCTION	CHIEF CONSTR QC ENGR	MGR OF QA - TPO
MGR OF ENGINEERING	CLIENT	GPC - QA MGR
MGR OF PROCUREMENT	PROCE	LAPD - QA MGR
MGR OF PROJ OPERATIONS	PROJECT CONSTR MGR	SPPD - QA MGR
MGR OF QUALITY ASSURANCE	PROJECT ENGINEER	
CONSTRUCTION MGR	PROJECT MGR	
ENGINEERING MGR	PROJ PROCUREMENT MGR	
SUPPLIER QUALITY MGR	SITE MGR	
QC SUPERVISOR		

FORMAL REPORT TO CLIENT _____
(If Section II Applies) Date

CORRECTIVE ACTION IMPLEMENTED

Describe in space provided and attach reference document

VERIFIED BY _____
Project QA Engineer Date

Bechtel Associates Professional Corporation

SUBJECT: MCAR 48 (issued 1/29/81)

022437

The Existence of Cracks in the Borated Water Storage
Tank Foundation - Units 1 and 2

INTERIM REPORT 1

DATE: February 17, 1981

PROJECT: Consumers Power Company
Midland Plant Units 1 and 2
Bechtel Job 7220

Introduction

The 52-foot diameter, stainless steel borated water storage tanks are 32 feet high and rest on compacted, granular backfill material contained within a reinforced-concrete ring wall. On one side is an integral valve pit that houses connections and valves for the two 18-inch diameter pipelines that service each tank. Figure 31.1 from the response to NRC 10 CFR 50.54(f), Question 31 is attached for reference (see Figure 3).

During the load test on the Unit 1 tank (conducted in compliance with the response to 10 CFR 50.54(f), Question 4), a discrepancy was noted between measurements of settlements recorded at the jobsite and the computed displacements derived from the structural analysis used at that time. As a result, the analysis was modified to include a finite element model of the soil subgrade. A number of analyses were completed using various values for the modulus of elasticity (E) of the soil. The results of the analyses predicted that greater than allowable moments existed at several locations in the foundation structure (see Figure 1).

The foundation at these locations was examined to verify whether visible signs of high reinforcement strain existed. Cracks were found in the structure at those locations indicated by the analysis as having greater than allowable moments. The largest crack measured 0.063 inch. Subsequently, the Unit 2 tank foundation was also examined; similar cracks were found, and the largest crack measured 0.035 inch. The smaller bearing area of the Unit 2 valve pit partially explains why the cracks in the Unit 2 tank foundation are smaller than the cracks in the Unit 1 tank foundation.

Significance of Cracks

The cracks in the foundation structure of the Unit 1 tank indicate that high reinforcement strain exists in the ring wall foundation. As shown in Figure 2, the tank's outside periphery is attached to the ring wall foundation by equally spaced anchor bolts that transfer induced forces through an anchor chair. A check with jobsite construction personnel indicated that all anchor bolts were installed in a snug-tight condition

Bechtel Associates Professional Corporation

MCAR 48
Interim Report 1
February 17, 1981
Page 2

022437

consistent with installation requirements and were in contact with the top of the anchor chair when the tank was erected. However, recent field observations indicate that gaps exist between the anchor bolt nut and anchor bolt chair in several locations around the periphery of the tank; whereas, in other locations the horizontal plates of the anchor bolt chairs are deflected, indicating high tensile stress in the bolts.

This anchor bolt behavior results from the distortion of the foundation ring which is caused by differential settlement; this agrees with the conclusions of the modified structural analysis. The tension induced in the bolts is similar to the tension induced by a preload phenomenon and does not affect the ability of the bolts to resist design loads. Although the ring wall is cracked, it is capable of providing the necessary dead load anchorage for the anchor bolts and confinement of the tank foundation support material. Therefore, resistance will be provided for externally applied forces which induce tension in the anchor bolts.

Because the tank is made of ductile material (stainless steel), it is capable, through plastic deformation, of redistributing resulting loads. Although failure of the tank to hold water is not considered probable at the present time, without remedial action future behavior is difficult to establish.

Corrosion of the reinforcing steel in the ring beam, combined with increased displacements, may cause problems in the future. The concrete ring wall confines the foundation material which is loaded by the tank; this confinement causes hoop tension in the ring wall. Cracks equal in size to those observed in the ring wall expose the reinforcing steel to the groundwater and atmosphere. If the reinforcing steel carrying the hoop tension were to corrode significantly, the ability of the ring wall to resist the hoop tension would be reduced. Reduction of overall strength of the ring wall, combined with increased displacements (both vertically and laterally) of the ring wall may occur, causing stress concentrations in the tank near anchor chairs.

Based on the foregoing discussion, we believe that the cracking of the ring beam does not create a present safety problem for the tank. However, without additional extensive analysis, it cannot be conclusively shown that the safety of future plant operations would not have been affected if the deficiency had gone uncorrected. Therefore, the condition is being treated as reportable under the provisions of 10 CFR 50.55(e).

Probable Cause

Review of field observations and analytical investigations leads to a preliminary understanding of the probable cause. When the tank was loaded, the bearing pressure on the tank area was increased to approximately 2 ksf greater than the valve pit area; however, this 2 ksf differential was not accounted for in the calculation for ring beam reinforcing. As a result, the valve pit restrained the tank foundation from settling uniformly, causing bending at the ring wall/valve pit junction.

Bechtel Associates Professional Corporation

MCAR 48
Interim Report 1
February 17, 1981
Page 3

022437

Future Actions

A number of corrective action alternatives are currently under consideration that ensure the borated water storage tanks ability to perform its safety function:

1. Surcharge the valve pit to reduce crack widths and reduce the bending moments and, if required, reinforce the ring foundation
2. Partially excavate the soil beneath the valve pit to increase the bearing pressure under the valve pit and, therefore, reduce the bending moments in the ring
3. Use as is, show that the intended safety function can be fulfilled for the expected service period
4. Surcharge and then disconnect valve pit
5. Partially or totally reconstruct the foundation structure

Analysis of these and other alternatives is ongoing. A discussion of alternatives will be incorporated in future interim reports.

Submitted by:

R.C. Pierce

Reviewed by:

John

Approved by:

L.H. Curtis / m. [unclear]

Concurrence by:

K.D. Bailey

FIGURE 1

022437

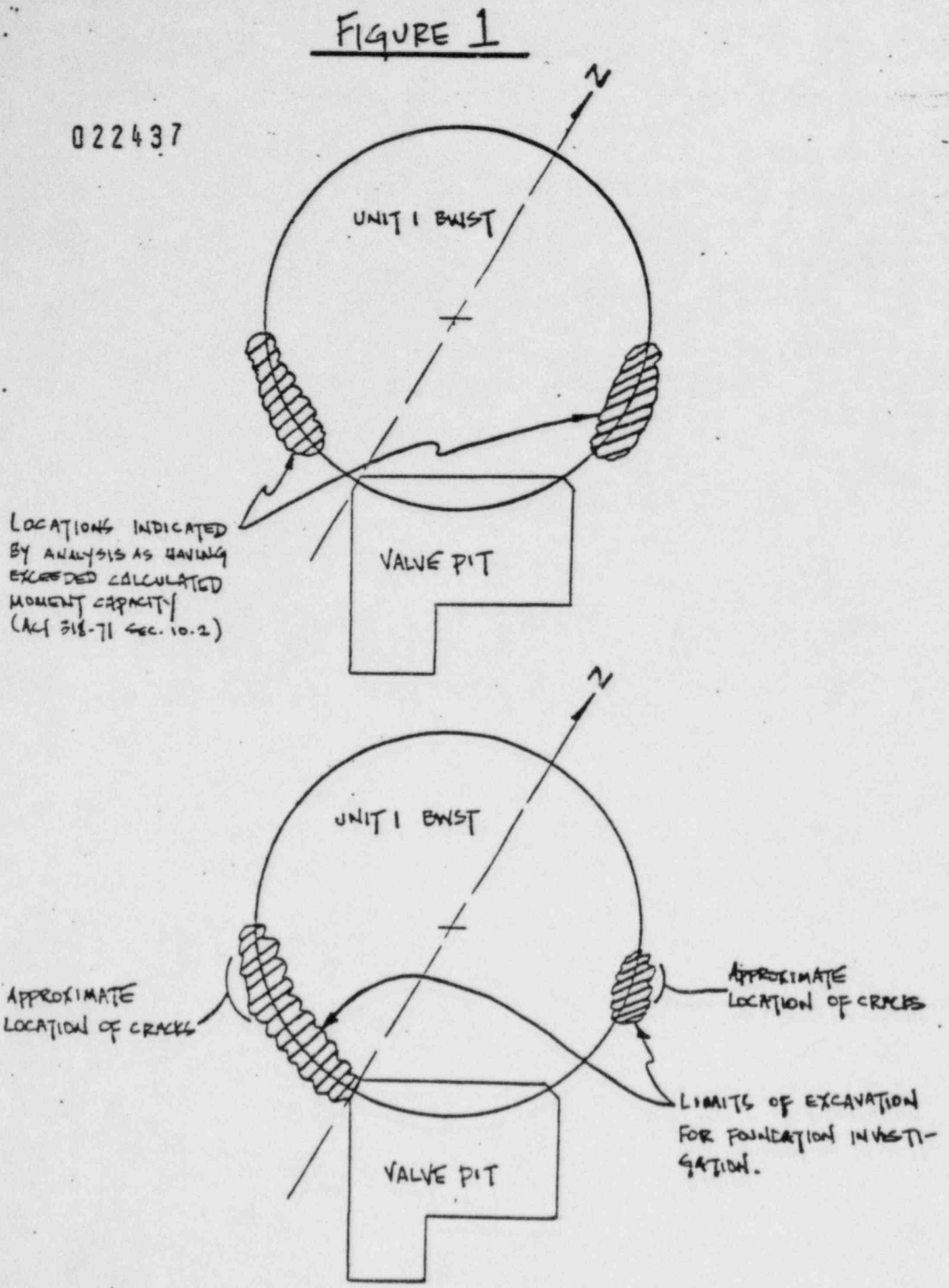
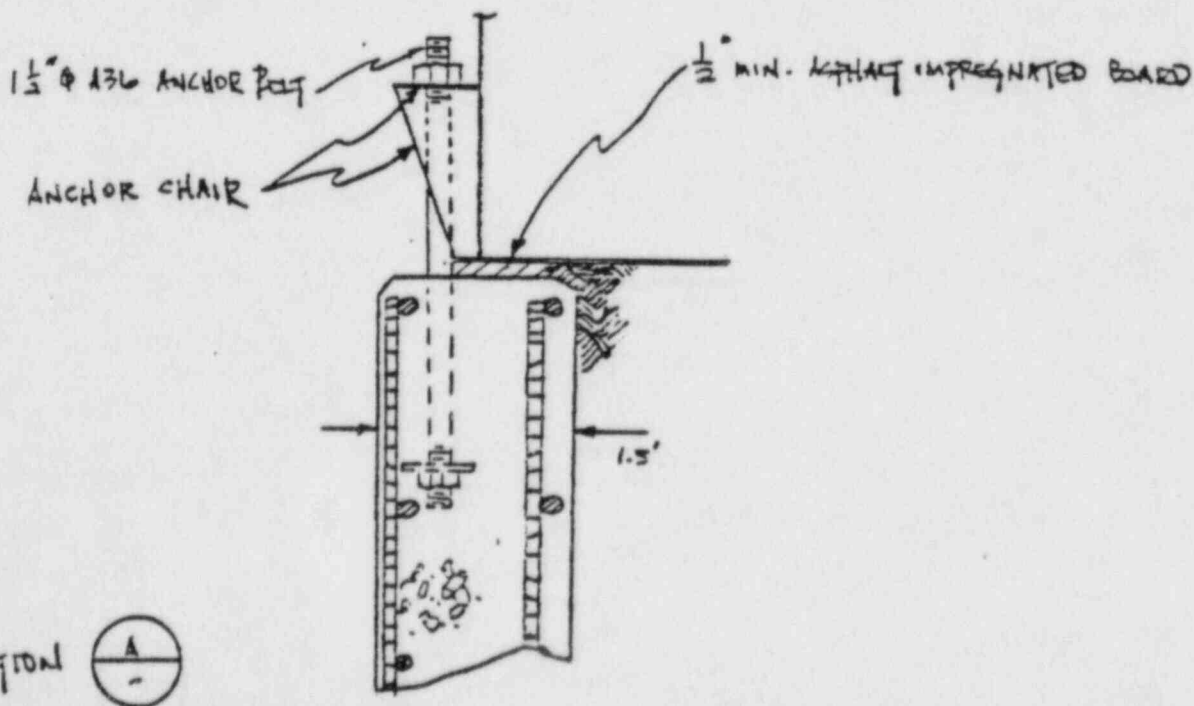
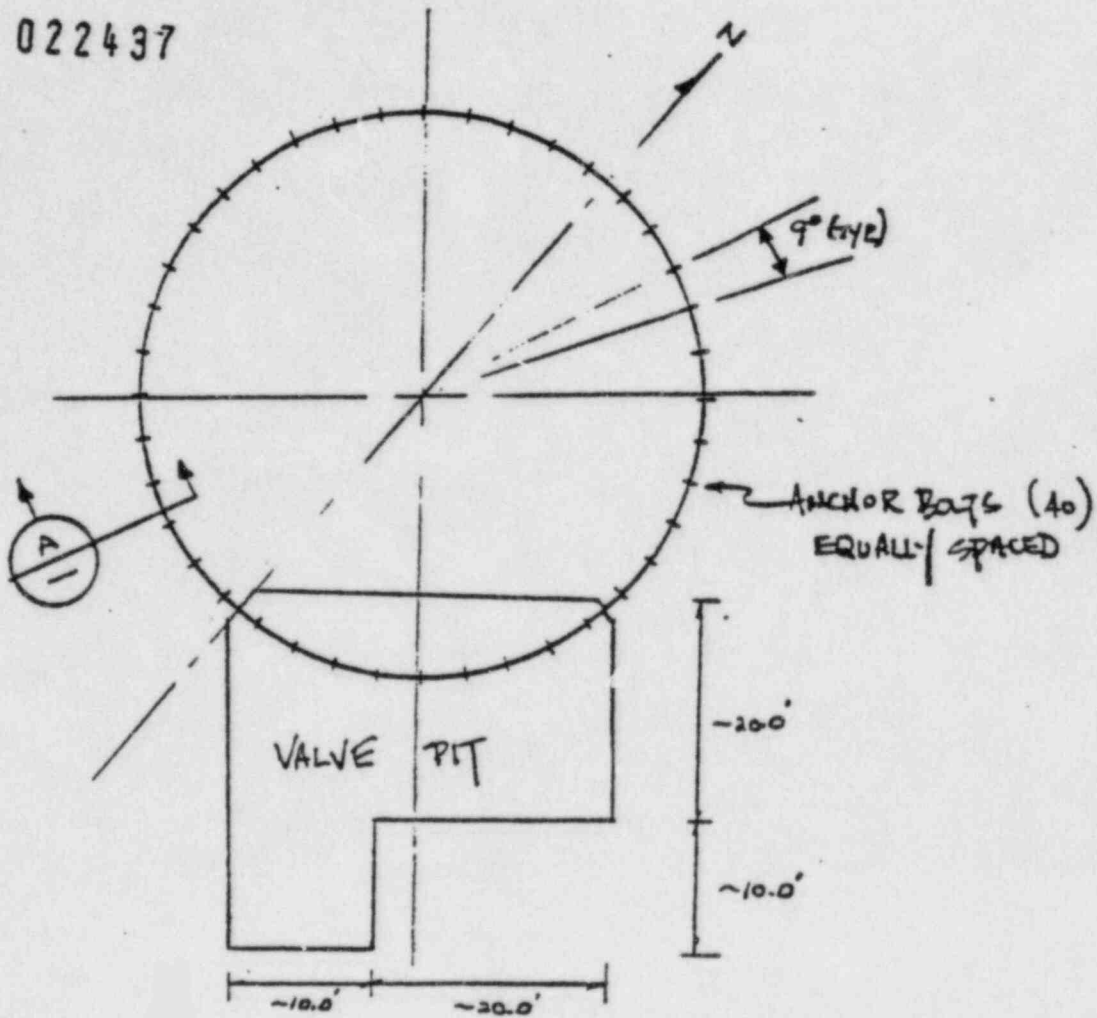
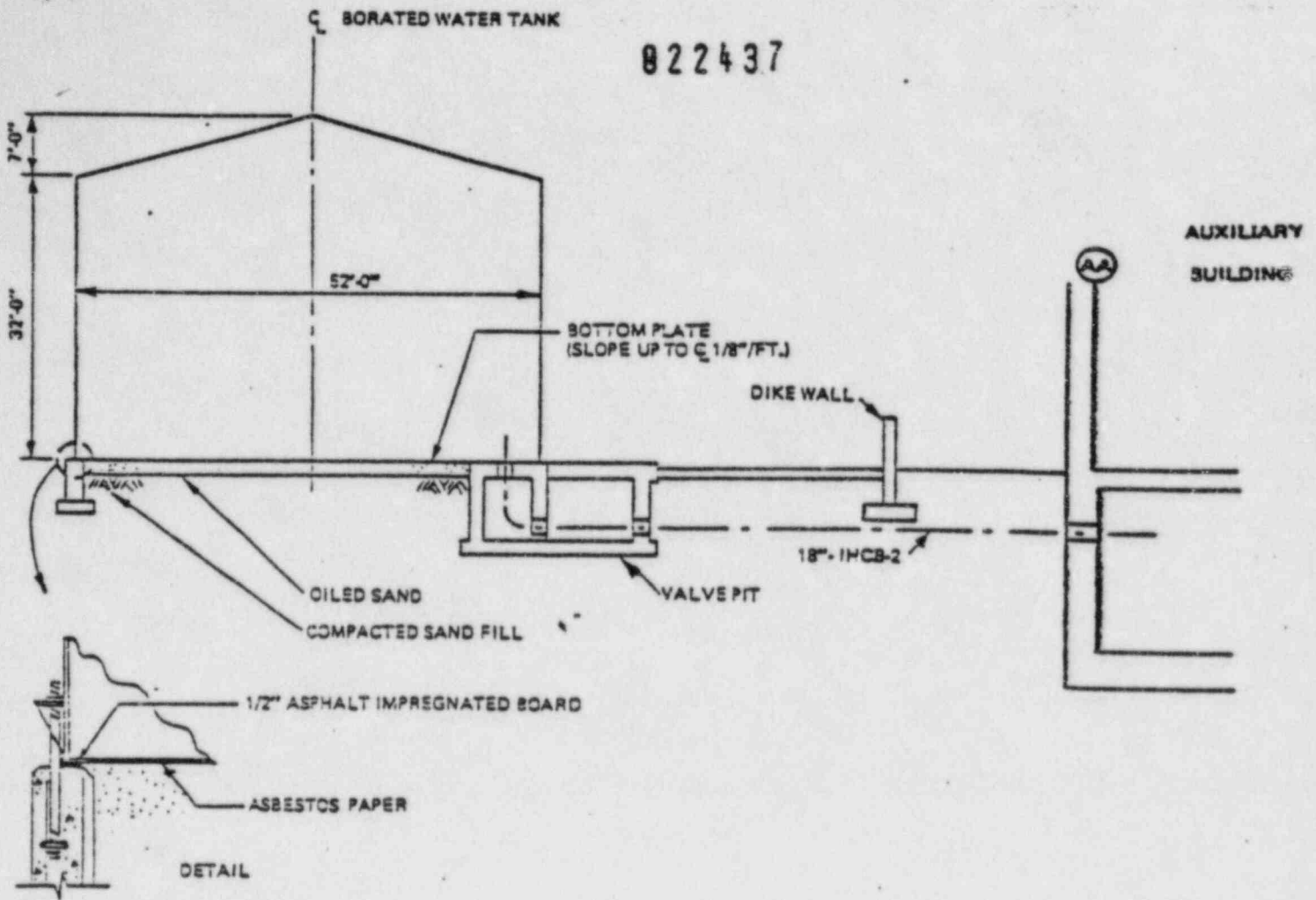


FIGURE 2

022437





CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2

Section Through Borated
Water Storage Tank
Foundation and Valve Pit

Figure 3